

WHAT IS CLAIMED IS:

1 1. A method for controlling automatic range shift decisions for
2 selecting an appropriate range state from at least two possible range states in a
3 manually shifted vehicular transmission system, the method comprising:
4 detecting an intent to shift signal;
5 determining a set of potential target gear ratios, in response to
6 detecting the intent to shift signal;
7 executing engine overspeed tests to verify at least one of the set of
8 potential target gear ratios;
9 determining an appropriate range state based on the target gear ratio
10 verified by the engine overspeed tests; and
11 controlling an automatic range shift to select the determined range
12 state based on the target gear ratio.

1 2. The method of claim 1 wherein the at least two possible range
2 states include high range and low range.

1 3. The method of claim 1 wherein determining the appropriate
2 range state further comprises:
3 determining if the vehicle speed is above a low speed latch; and
4 if the vehicle speed is above the low speed latch, executing the
5 method for controlling automatic range shift decisions, otherwise shifting the
6 transmission into low range.

1 4. The method of claim 1 wherein the detected intent to shift
2 signal triggers execution of the method for controlling automatic range shift
3 decisions.

1 5. The method of claim 1 further comprising:
2 detecting a shift knob force;
3 detecting at least one of a shift lever rail position or a transition to rail
4 position; and

5 formulating the intent to shift signal based on the detected shift knob
6 force and at least one of the shift lever rail position or the transition to rail position.

1 6. The method of claim 1 further comprising:
2 detecting a shift lever rail position;
3 detecting a splitter select switch position;
4 detecting a shift knob force direction; and
5 determining the set of potential target gear ratios based on the shift
6 lever rail position, the splitter select switch position, and the shift knob force
7 direction.

1 7. A method for controlling automatic range shift decisions for
2 selecting an appropriate range state from at least two possible range states in a
3 manually shifted vehicular transmission system, the method comprising:
4 detecting a set of transmission system criteria, the set of transmission
5 system criteria including a vehicle speed, a shift lever rail position, a transition to
6 rail position, a shift knob force, a shift knob force direction, and a position of a
7 splitter select switch;
8 detecting an intent to shift signal based on the shift knob force and the
9 shift knob force direction;
10 determining a set of potential target gear ratios based on the shift
11 lever rail position, the position of the splitter select switch, and the shift knob force
12 direction;
13 executing engine overspeed tests to select one ratio from the set of
14 potential target gear ratios based on the set of transmission system criteria, in
15 response to the detection of an operator's intent to shift signal;
16 determining an appropriate range state based on the selected target
17 gear ratio verified by the engine overspeed tests; and
18 initiating an automatic range shift for selecting the determined range
19 state based on the selected target gear ratio.

1 8. The method of claim 7 wherein determining the appropriate
2 range state further comprises:

3 determining if the vehicle speed is above a low speed latch; and
4 if the vehicle speed is above the low speed latch, executing the
5 method for controlling automatic range shift decisions, otherwise shifting the
6 transmission into low range.

1 9. The method of claim 7 wherein determining the appropriate
2 range state further comprises shifting the transmission into high range if a) the shift
3 lever is on low rail or if a transition to low rail is detected and the shift lever
4 position is in neutral, and b) the transmission is in low range and the engine
5 overspeed test indicates a positive result.

1 10. The method of claim 7 wherein determining the appropriate
2 range state further comprises shifting the transmission into low range if a) the shift
3 lever is on low rail or if the transition to low rail is detected and the shift lever
4 position is in neutral, and b) the transmission is in high range and the engine
5 overspeed test indicates a negative result.

1 11. The method of claim 7 wherein determining the appropriate
2 range state further comprises shifting the transmission into low range if a) the shift
3 lever is on low rail or if a transition to low rail is detected and the shift lever
4 position is in neutral, and b) the range state is unknown and the engine overspeed
5 test indicates a negative result, otherwise shifting the transmission into high range.

1 12. The method of claim 7 wherein the at least two
2 possible range states includes a low range and a high range, the method comprising:
3 detecting a splitter select switch position; and
4 if the transmission is in low range and a) the splitter select switch
5 indicates a splitter low position and the engine overspeed test for a first gear ratio
6 indicates a positive result, or b) the splitter select switch indicates a high position
7 and the engine overspeed test for a second gear indicates a positive result, then
8 shifting the transmission into high range.

1 13. The method of claim 7 wherein the at least two possible range
2 states includes a low range and a high range, the method comprising:
3 detecting a splitter select switch position; and
4 if the transmission is in high range and a) the splitter select switch indicates
5 a splitter low position and the engine overspeed test for a first gear ratio indicates
6 a negative result, or b) the splitter select switch indicates a splitter high position and
7 the engine overspeed test for a second gear ratio indicates a negative result, then
8 shifting the transmission into low range.

1 14. The method of claim 7 wherein the at least two possible range
2 states includes a low range and a high range, the method comprising:
3 detecting a splitter select switch position; and
4 if the transmission state is unknown and a) the splitter select switch indicates
5 a splitter low position and the engine overspeed test for a first gear ratio indicates
6 a negative result, or b) the splitter select switch indicates a splitter high position and
7 the gear overspeed test for a second gear ratio indicates a negative result, then
8 shifting the transmission into low range, otherwise shifting the transmission into
9 high range.

1 15. The method of claim 7 wherein determining the appropriate
2 range state further comprises shifting the transmission into low range if a) the shift
3 lever is on high rail or if a transition to high rail is detected and the shift position is
4 in neutral, and b) the transmission is in high range and the engine overspeed test
5 indicates a negative result.

1 16. The method of claim 7 wherein determining the appropriate
2 range state further comprises maintaining a transmission in low range if a) the shift
3 lever is on high rail or if a transition to high rail is detected and the shift position is
4 in neutral, and b) the transmission is currently in low range.

1 17. The method of claim 7 wherein determining the appropriate
2 range state further comprises shifting the transmission into low range if a) the shift
3 lever is on high rail or if a transition to high rail is detected and the shift position is

4 in neutral, and b) the current range state is unknown and the engine overspeed test
5 indicates a negative result, otherwise shifting the transmission into high range.

1 18. A manually shifted compound transmission system
2 comprising:

3 a manually operated shift lever;

4 a position sensor for providing a position signal indicative of a position of
5 the shift lever;

6 a force threshold detector for providing a shift knob force signal indicative
7 of forces applied to the shift lever in a longitudinal direction;

8 a splitter select switch for engaging a selected splitter ratio and for providing
9 a signal indicative thereof;

10 a speed sensor for providing signals indicative of engine rotational speed;

11 a control logic for receiving input signals from the position sensor, the force
12 threshold sensor, the splitter select switch, and the speed sensor to formulate an
13 intent to shift signal and to determine a set of potential target gear ratios, the control
14 logic executing engine overspeed tests to verify at least one of the set of potential
15 target gear ratios, and automatically determining an appropriate range state of the
16 transmission system based on the selected target gear ratio; and

17 a range shift mechanism for shifting the transmission system into the
18 appropriate range state as determined by the control logic.

1 19. The manually shifted compound transmission system of claim
2 18 wherein the position signal is operable to indicate a transition to one of at least
3 two possible rail positions including high rail and low rail.

1 20. The manually shifted compound transmission system of claim
2 18 wherein the splitter select switch is operable to toggle between splitter high and
3 splitter low gear ratios.

1 21. The manually shifted compound transmission system of claim
2 18 wherein the speed signal is operable to indicate whether the vehicle is operating
3 above a low speed latch; and if the vehicle speed is above the low speed latch,

4 executing the method for controlling automatic range shift decisions, otherwise the
5 transmission is shifted into low range.

1 22. The manually shifted compound transmission system of claim
2 18 wherein the control logic includes logic rules for analyzing the input signals, for
3 processing the input signals to automatically determine an appropriate range state of
4 the transmission system, and for delivering an output signal to the system actuators
5 to cause the transmission to shift to one of the at least two possible range states.

1 23. The manually shifted compound transmission system of claim
2 18 wherein determining the appropriate range state of the transmission system
3 comprises shifting the transmission into high range if a) the shift lever is on low rail
4 or if the position signal indicates a transition to low rail and the shift lever position
5 is in neutral, and b) the transmission is in low range and an overspeed test indicates
6 a positive result.

1 24. The manually shifted compound transmission system of claim
2 18 wherein determining the appropriate range state further comprises shifting the
3 transmission into low range if a) the shift lever is on low rail or if the position signal
4 indicates a transition to low rail and the shift lever position is in neutral, and b) the
5 transmission is in high range and the overspeed test indicates a negative result.

1 25. The manually shifted compound transmission of claim 18
2 wherein determining the appropriate range state further comprises shifting the
3 transmission into low range if a) the shift lever is on low rail or if a transition to low
4 rail is detected and the shift lever position is in neutral, and b) the range state is
5 unknown and the overspeed test indicates a negative result, otherwise shifting the
6 transmission into high range.

1 26. The manually shifted compound transmission system of claim
2 18 wherein the at least two possible range states comprises a low range and a high
3 range, the system comprising:
4 detecting a splitter select switch position; and

5 if the transmission is in low range and a) the splitter select switch
6 indicates a splitter low position and a gear overspeed test for a first gear ratio is
7 true, or b) the splitter select switch indicates a splitter high position and the gear
8 overspeed test for a second gear ratio is true, then shifting the transmission into high
9 range.

1 27. The manually shifted compound transmission system of claim
2 18 wherein the at least two possible range states comprises a low range and a high
3 range, the system comprising:

4 detecting a splitter select switch position; and

5 if the transmission is in high range and a) the splitter select switch indicates
6 a splitter low position and a gear overspeed test for a first gear ratio is false, or b)
7 the splitter select switch indicates a splitter high position and a gear overspeed test
8 for a second gear ratio is false, then shifting the transmission into low range.

1 28. The manually shifted compound transmission system of claim
2 18 wherein the at least two possible range states comprises a low range and a high
3 range, the system comprising:

4 detecting a splitter select switch position; and

5 if the transmission state is unknown and a) the splitter select switch indicates
6 a splitter low position and a gear overspeed test for a first gear ratio is false, or b)
7 the splitter select switch indicates a splitter high position and a gear overspeed test
8 for a second gear ratio is false, then shifting the transmission into low range,
9 otherwise shifting the transmission into high range.

1 29. The manually shifted compound transmission system of claim
2 18 wherein determining the appropriate range state further comprises shifting the
3 transmission into low range if a) the shift lever is on high rail or if the position
4 signal indicates a transition to high rail and the shift position is in neutral, and b) the
5 transmission is in high range and the overspeed test indicates a negative result.

1 30. The manually shifted compound transmission system of claim
2 18 wherein determining the appropriate range state further comprises maintaining

3 a transmission in low range if a) the shift lever is on high rail or if the position
4 signal indicates a transition to high rail and the shift position is in neutral, and b) the
5 transmission is currently in low range, then maintaining the transmission in low
6 range.

1 31. The manually shifted compound transmission system of claim
2 18 wherein determining the appropriate range state further comprises shifting the
3 transmission into low range if a) the shift lever is on high rail or if the position
4 signal indicates a transition to high rail and the shift position is in neutral, and b) the
5 current range state is unknown and the overspeed test indicates a negative result,
6 otherwise shifting the transmission into high range.